Synthesis and Self-Assembly Behavior of Poly(acrylic Acid)-*b*-Poly(*l*-Amino Acid) System

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***Abstract*—The talk will present the synthesis and characterization of a new class of hybrid amphiphilic system between an electrolyte polyacrylic acid (PAA) synthetic segment, and a hydrophobic beta-sheet forming peptide segment, poly(L-valine) (PLVAL). The synthesis of monodispersed copolymers (Mw/Mn < 1.3) was achieved through a combination of atom transfer radical polymerization[1], click chemistry[2], and nickel-catalyzed ring opening of N-carboxy anhydrides[3,4] (Figure 1). The click chemistry is demonstrated to be an excellent method for the intermediate -amino functionalization step to afford macroinitiators that are free from deactivating or interfering molecules with degree of functionality about 90%.**

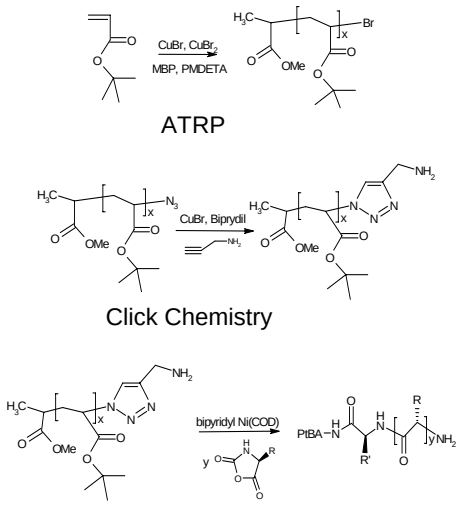

Figure 1: Synthesis Scheme of poly(acrylic acid)-block-poly(l-valine)

Light scattering and circular dichroism characterization of PAA_x-block-$PLVAL_y$ (x-y of 80-100, 80-80, 80-60, and 40-100) show a correlation of the formation of spherical core-shell micelles to the ability of the peptide segment to form ordered beta-sheet structures. Generally, the beta sheet formation is stabilized by a low pH condition (low charge on PAA), higher Val/PAA ratio (less interference from PAA-Val hydrogen bondings), and degree of core shielding by PAA in the presence of disrupting agents, e.g. urea. At higher pH, the beta-sheet structure was also found to counteract the charge repulsions of PAA units, which allows the micelles to retain their overall size and shape.

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